centrifugal high-density cleaners, followed by a turbo-separator, working at 3% consistency. The following thickening stage is also simplified and composed of inclined screws producing pulp at 15% consistency, followed by a screw press. The finest contaminants will be detached and better dispersed during the ink-releasing step (5) and then carried away with the effluent during the washing stage. They will remain in the secondary pulp thus contributing to add weight and volume to the board, as the underliner does not need to be particularly cleaned.

The pulp entering the ink-releasing and dispersing step shows a brightness=50° ISO, a filler content=-25–30%. The operating parameters are the same as for example (1), but the brightness drops down to 46°–48° ISO.

The following washing step has only two stages, which are fed at 2,5% consistency. The perforated plates of the inclined screws have 1,6 mm. diameter holes, and it has been found that the characteristics of the effluent are very similar to the one of example 1.

The washed primary pulp shows a brightness=68° ISO, a filler content=4% and a freeness=45°-50° SR. The fine cleaning of the primary pulp is achieved with the cleaners and the screens installed ahead of the board machine, which is sufficient to reach the desired quality. It must be said that the contaminants have been thoroughly dispersed in the kneader (5) and most of them have left this primary pulp during the washing step.

The satellite circuit is also simplified because the brightness of the underliner has only a third-order influence on the final brightness of the coated board. We have observed that a brightness of the underliner secondary pulp in the 50° ISO range was sufficient to insure the required brightness 80° ISO of the coated board, providing that the top liner primary pulp has 70° ISO. Thus, the flotation time has been reduced below 10 min. and the dosing of the collector has been kept below 2%. We have also observed that it was possible to run without any chemical when lower quality grades are produced, but no compromise can be applied on the dispersion effect, because black spots in the underliner are always visible even through the coated top liner.

The application of such a process to the production of stratified board is offering the following advantages:

(a) possibility to totally replace chemical pulp or high quality selected unprinted waste paper by a low value and large availability raw material;

(b) simplification of the main line by eliminating the fine screening and cleaning equipment;

(c) increase of the total yield, by transferring in the secondary pulp (and then in the underliner or in the middle ply) all finely dispersed contaminants which are not acceptable in the top liner.

I claim:

1. A method of treating a mixture of printed and contaminated waste paper in order to produce a pulp for use in the manufacture of paper and paperboards, said waste paper containing non-ink contaminants including stickies, which method comprises:

(a) forming a first aqueous fibrous suspension of said waste paper at room temperature by applying specific mechanical energy lower that 50 KW.H/Ton to form a pumpable slurry and to release substantially all of the non-ink contaminants including the stickies, from the surface of the paper and without dispersing such non-ink contaminants as finely

divided particles throughout the fibrous suspension;

(b) removing substantially all of the non-ink contaminants including the stickies, which have been released without dispersal as finely divided particles from the first fibrous suspension by screening and cleaning at room temperature to form a second aqueous fibrous suspension substantially free of the non-ink contaminants including the stickies;

(c) after the step of removing the non-ink contaminants softening the ink vehicles and weakening their binding with the surface of the fibers by submitting the second fibrous suspension at a consistency of more than 15% to the simultaneous actions of (A) a high temperature between 85° and 130° C., (B) high shear forces substantially corresponding to a specific mechanical energy of more than 50 KW.H/Ton applied at the said consistency of more than 15% and (C) at least one deinking agent under strong alkaline conditions having a pH of at least 9; and

(d) detaching the ink particles from the surface of the fibers and dispersing them into the second fibrous suspension by submitting the second fibrous suspension to the simultaneous actions of (A) high temperature between 85° and 130° C., (B) high shear forces substantially corresponding to a specific mechanical energy of more than 50 KW.H/Ton applied at the said consistency of more that 15% and (C) at least one chemical dispersing agent, under strong alkaline conditions having a pH of at least 9 whereby higher specific energy inputs and higher temperatures are used to detach the ink particles from the fibers of the second fibrous suspension after removal of the non-ink contaminants than are used on the first fibrous suspension before removal of the non-ink contaminants;

(e) limiting the total duration of the ink softening and detaching steps (c) and (d) to a range between 2 and 10 minutes and

(f) removing the detached ink particles from the second fibrous suspension to provide a brightness of at lesat 59 ISO the final pulp.

2. The method of claim 1 wherein the specific energy applied to the fibrous suspension during the forming step (a) is applied for approximately 20 minutes.

3. The method of claim 1 wherein the ink softening and detaching steps (c) and (d) are conducted at a pressure higher than the atmospheric pressure.

4. The method of claim 1 wherein the total duration of the ink softening and detaching steps (c) and (d) is kept between 3 and 5 minutes.

5. the method of claim 1 wherein the total specific energy applied during the ink softening and detaching steps (c) and (d) is about 80 KW.H/Ton.

6. The method of claim 1 wherein the ink softening and detaching steps (c) and (d) are performed simultaneously in a single apparatus.

7. The method of claim 1 wherein the ink softening and detaching steps (c) and (d) are performed separately in two different pieces of equipment.

8. The method of claim 1 wherein the removing of the ink particles from the fibrous suspension is achieved by washing.

9. The method of claim 1 wherein the alkalinity of the fibrous suspension in steps (c) and (d) is obtained by adding any one of the following chemicals:

sodium hydroxide, potassium hydroxide, calcium hydroxide, magnesium hydroxide, sodium carbonate, sodium phosphate, sodium tripolyphosphate, sodium pyrophosphate, sodium silicate.

10. The method of claim 1 wherein an oxidizing agent is added during the ink softening and detaching steps (c) and (d).

11. The method of claim 1 wherein a bleaching action is performed during the ink softening and detaching steps (c) and (d).

12. The method of claim 1 wherein the ink softening and detaching steps (c) and (d) are performed simultaneously in a triturator.

13. The method of claim 1 wherein the ink softening and detaching steps (c) and (d) are performed simultaneously in a disintegrator.

14. A method of claim 1 wherein the ink softening and detaching steps (c) and (d) are performed separately in a steaming chamber followed by a disperser.

15. The method of claim 1 wherein the step of removing the ink particles from the fibrous suspension is achieved by froth flotation.

16. The method of claim 1 wherein the step of removing the ink particles from the fibrous suspension is achieved by washing and froth flotation.

17. The method of claim 1 wherein the alkalinity of the fibrous suspension in steps (c) and (d) is obtained by adding a mixture of chemicals selected from the group consisting of, sodium hydroxide, potassium hydroxide, calcium hydroxide, magnesium hydroxide, sodium carbonate, sodium phosphate, sodium tripolyphosphate, sodium pyrophosphate, sodium silicate.

18. The method of claim 1 wherein the ink softening and detaching steps (c) and (d) are achieved at a consistency between 25% and 30%.

* * * * *

CLAIMS

19. A method of treating a mixture of printed and contaminated waste paper in order to produce pulp for use in the manufacture of paper and paperboards, said waste paper containing non-ink contaminants, said method comprising the steps of:

(a) forming an aqueous fibrous suspension of waste paper;

(b) removing substantially all of the non-ink contaminants from the fibrous suspension;

(c) releasing the ink particles from the surface of the fibers by submitting the fibrous suspension to the simultaneous action of high temperature, high shear forces and at least one chemical de-inking agent;

(d) dispersing the ink particles in the fibrous suspension by submitting the fibrous suspension to the simultaneous action of high temperature, high shear forces and at least one chemical dispersing agent;

(e) removing the dispersed ink particles and substantially all of the remaining dispersed fine material from the fibrous suspension using at least one stage of washing elements so as to produce

(A) a primary pulp having controlled and constant brightness and fiber classification and very low and constant filler content, and

(B) a secondary fibrous suspension having a high and variable filler content, a variable quantity of fine fibers, ink particles and a small quantity of long fibers;

(f) coagulating the ink particles by mixing the secondary fibrous suspension together with ink collecting agents;

(g) removing the ink particles from the secondary fibrous suspension by selective separation of the ink collecting agents from the suspension;

(h) filtering the secondary fibrous suspension at a low filtration rate on a fibrous mat composed of fibers coming from the same process so as to produce

(C) a secondary de-inked pulp having a fine fiber classification and a very high filler content, wherein said fiber classification and said filler content of said secondary pulp are both instantaneously variable, and

(D) an effluent which is substantially free of suspended solids;

(i) diluting the secondary pulp with the effluent, and

(j) storing the secondary pulp for several hours during which time the secondary pulp is subjected to intense mixing to stabilize the fluctuations in the secondary pulp's filler content, fiber classification and freeness.

20. The method of claim 19 wherein steps (a) and (b) are carried out in the manner set forth in steps (a) and (b) of claim 1.

21. The method ~~of~~ claim 19 wherein steps (c) and (d) are carried out in the manner set forth in steps (c) through (e) of claim 1.

22. The method of claim 19 wherein step (g) is further characterized in that the ink particles are removed from the secondary fibrous suspension by froth floatation.

23. The method of claim 22 wherein the ink collecting agents are selected from the group consisting of high molecular weight fatty acids, sodium soaps of said fatty acids and calcium soaps of said fatty acids.

24. The method of claim 19 wherein the consistency of the secondary fibrous suspension entering step (g) is maintained between 0.6% and 1.5%.

25. The method of claim 24 wherein the consistency of the secondary fibrous suspension entering step (f) is maintained between 1% and 1.2%.

26. The method of claim 24 wherein the consistency of the secondary fibrous suspension entering step (f) is increased by adding fibers extracted from the fibrous suspension of waste paper ahead of the ink removal step (e).

27. The method of claim 19 wherein the consistency of the secondary fibrous suspension entering step (h) is maintained between 0.8% and 2%.

28. The method of claim 27 wherein the consistency of the secondary fibrous suspension entering step (h) is maintained between 1.2 and 1.5%.

29. The method of claim 27 wherein the consistency of the secondary fibrous suspension entering step (h) is increased by adding de-inked primary pulp formed in step (e).

30. The method of claim 24 further characterized in that steps (f) and (g) are carried out in washing apparatus having draining elements with openings formed therein, wherein the consistency of the secondary fibrous suspension is maintained by increasing and optimizing the openings formed the draining elements.

31. The method of claim 30 wherein the washing apparatus comprises inclined screws fitted with perforated plates, said perforations having a diameter varying between 1.2 and 2.2mm.

32. The method of claim 27 further characterized in that steps (h) is carried out in washing apparatus having draining elements with openings formed therein, wherein the consistency of the secondary fibrous suspension is maintained by increasing and optimizing the openings formed the draining elements.

33. The method of claim 32 wherein the washing apparatus comprises inclined screws fitted with perforated plates, said perforations having a diameter varying between 1.2 and 2.2mm.

34. The method of claim 19 further characterized in that a sodium silicate stabilizer is introduced in step (d) and said sodium silicate stabilizer is precipitated as a mineral filler by the use of unsolubilizing cations prior to step (h).

35. The method of claim 34 wherein the unsolubilizing cations are selected from the group consisting of calcium hydroxide, calcium chloride, magnesium hydroxide, alkaline compounds of the Group 3 earth metals excluding aluminum, and mixtures thereof.

36. The method of claim 19 further characterized in that the filtration step (h) is conducted upon a moving fabric at low filtering flow rates thereby creating a fibrous mat on said fabric, said fibrous mat being subsequently peeled away from said fabric.

37. The method of claim 36 further characterized in that a filter flow rate is selected so that the clear filtrate does not contain more than 150ppm suspended solids.

38. The method of claim 37 further characterized in that a filter flow rate is selected so that the clear filtrate does not contain more than 100 ppm.

39. The method of claim 36 further characterized in that a filter flow rate is selected so that the consistency of the filtered secondary pulp is maintained above 5%.

40. The method of claim 39 further characterized in that a filter flow rate is selected so that the consistency of the filtered secondary pulp is maintained above 10%.

41. The method of claim 37 further characterized in that the filtration step is carried out on a filtration apparatus comprising a disk filter working at a flow rate of between 15 and 30 liters/minute/square meter.

42. The method of claim 41 further characterized in that the filtration step is carried out on a filtration apparatus comprising a disk filter working at a flow rate of between 20 and 25 liters/~~minute~~/square meter.

43. The method of claim 39 further characterized in that the filtration step is carried out on a filtration apparatus comprising a disk filter working at a flow rate of between 15 and 30 liters/minute/square meter.

44. The method of claim 43 further characterized in that the filtration step is carried out on a filtration apparatus comprising a disk filter working at a flow rate of between 20 and 25 liters/minute/square meter.

45. The method of claim 39 further characterized in that compressed air is used to peel the fibrous mat away from the fabric.

46. The method of claim 45 wherein said compressed air is mixed with water.

47. The method of claim 30 wherein the washing apparatus comprises inclined screws fitted with perforated plates, said perforations having a diameter varying between 1.4 and 2mm.

48. The method of claim 32 wherein the washing apparatus comprises inclined screws fitted with perforated plates, said perforations having a diameter varying between 1.4 and 2mm.